UNIVERSITI POLY-TECH MALAYSIA

FINAL EXAMINATION

BACHELOR OF INFORMATION TECHNOLOGY (HONOURS) IN CYBER SECURITY
BACHELOR OF INFORMATION TECHNOLOGY (HONOURS) IN BUSINESS COMPUTING

COURSE	:	**STATISTICS**
COURSE CODE	:	**STA2103**
DURATION	:	**3 HOURS**

INSTRUCTIONS TO CANDIDATES:

1. This question paper consists of **FOUR (4)** questions.

2. Answer ALL questions.

3. Please check to make sure that this examination pack consists of:

   i. The Question Paper
   ii. an Answer Booklet
   iii. Appendix 1(1) and 1(2)
   iv. Appendix 2

4. Do not bring any material into the examination hall. Electronic calculator is allowed.

5. Please write your answer using permanent ink.

MYKAD/ PASSPORT NO. : _____

ID. NO. : _____

LECTURER : _____

SECTION : _____

DO NOT OPEN THIS QUESTION PAPER UNTIL YOU ARE TOLD TO DO SO

This question paper consists of 5 printed pages including the front page

QUESTION 1

a. A random variable X, representing the number of strawberries in a strawberry puff has the following probability distribution.

Table 1

X	2	3	4	5	6
$P(X = x)$	0.01	0.25	k	0.30	0.04

i. Find the value of k.

(3 marks)

ii. Find the probability that the number of strawberries in the strawberry puff is less than 4.

(3 marks)

iii. Calculate the mean and variance for the number of strawberries in a strawberry puff

(5 marks)

b. A coat manufacturer finds that on average, 12% of his coats are rejected because they are either oversize or undersized.

i. Find the probability that a batch of 10 coats will contain exactly 2 rejected coats.

(3 marks)

ii. Calculate the mean and variance of the coat manufactured by the company that will be rejected.

(4 marks)

c. The mean number of typing errors in a document is 1.5 per page. Find the probability that on a page chosen at random, there are:

i. 3 mistakes.

(2 marks)

ii. 1 to 2 mistakes.

(5 marks)

(Total: 25 marks)

QUESTION 2

a. The time taken for waiters in a fast food restaurant to serve their customers follows a normal distribution with a mean of 2.90 minutes and standard deviation of 1.74 minutes. Find the probability that a randomly selected waiter serves his or her customer

i. in less than 6 minutes.

(4 marks)

ii. between 5 minutes and 7 minutes.

(7 marks)

b. Plastic bags used for packaging produce are manufactured so that the breaking strength of the bag is normally distributed with a mean of 5 kg and a standard deviation of 1.5 kg. A sample of 25 bags is selected.

i. Calculate the standard deviation of the sampling distribution.

(3 marks)

ii. Find the probability that the average breaking strength is less than 4.6 kg

(4 marks)

iii. Find the probability that the average breaking strength is between 4.2 and 5.5 kg.

(7 marks)

(Total: 25 marks)

QUESTION 3

a. The owner of a restaurant that serves western food wants to study the characteristics of customers at his restaurant. In particular, he decides to focus on the amount of money spent per customer on western food at the restaurant. From a sample of 60 customers, the result shows that the mean amount spent per customer on western food is RM40.50 with a standard deviation of RM9.00.

i. Find the best point estimate of the population mean.

(2 marks)

ii. Construct a 95% confidence interval for the mean amount spent on western food at the restaurant.

(6 marks)

iii. Determine the sample size necessary to estimate the population mean to be 90% certain with maximum error of RM2.

(4 marks)

b. In a clinical trial of a certain drug, 25 subjects experience headaches among the 200 subjects treated with the drug.

i. Calculate the best point estimate of the population proportion.

(2 marks)

ii. Construct a 95% confidence interval estimate for the proportion of treated subjects who experience headaches.

(7 marks)

iii. How many subjects should be selected so that the 99% confidence interval for p is within 0.05 of the population proportion?

(4 marks)

(Total: 25 marks)

QUESTION 4

a. Write the null and alternative hypothesis for each of the following statement.

i. To test if the mean number of hours spent working per week by college students who hold jobs is different from 20 hours.

(2 marks)

ii. To test whether the mean starting salary of college graduates is higher than RM27000 per year.

(2 marks)

b. A credit card company wonders whether offering a mystery gift for every purchase will increase the use of the card, which has a current average of RM2500 per year. The result of giving a mystery gift to 51 customers found that the mean sample was RM2542. Assume the population standard deviation is $\sigma = \text{RM}109$. At 1% significance level is there sufficient evidence to conclude that the mean card usage will be increase with the mystery gift?

i. State the null and alternative hypothesis.

(2 marks)

ii. Find the critical value for $\alpha = 0.01$.

(2 marks)

iii. Compute the test statistics.

(3 marks)

iv. State the decision and conclusion for the above study.

(4 marks)

c. The university library does inventory once per year to locate mis-shelved or lost books. Inventory is expensive, so if evidence strongly suggests the proportion of lost or mis-shelved books is less than 0.02, the inventory will proceed this year. A random sample of 1000 books on the system are taken, 15 were not locatable. Perform a hypothesis test at $\alpha = 0.05$ whether there is enough evidence to the proportion of lost or mis-shelved books is less than 0.02.

(10 marks)

(Total: 25 marks)

(TOTAL: 100 MARKS)

END OF QUESTION PAPER

APPENDIX 1(1)

Discrete Probability Distribution

1. Discrete random variable
   a. $\mu = \sum xP(x)$
   b. $\sigma^2 = \sum x^2 P(x) - \mu^2$

2. Binomial Distribution
   a. $P(X = r) = {}^nC_r p^r q^{n-r}$
   b. $\mu = np$
   c. $\sigma^2 = npq$

3. Poisson Distribution
   a. $P(X = k) = \frac{\lambda^k e^{-\lambda}}{k!}$
   b. $\mu = \sigma^2 = \lambda$

Normal Distribution

1. Standardized score: $z = \frac{x - \mu}{\sigma}$

Sampling Distribution

1. Mean of $\bar{x}$: $\mu_{\bar{x}} = \mu$
2. Standard deviation of $\bar{x}$: $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$
3. z value for $\bar{x}$: $z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}}$

Estimation of mean

i. Margin of error for the point estimation of μ : $\pm 1.96 \frac{\sigma}{\sqrt{n}}$

ii. Confidence interval μ for a large sample

$$\mu = \bar{x} \pm z \frac{\sigma}{\sqrt{n}} \quad \text{or} \quad \mu = \bar{x} \pm z \frac{s}{\sqrt{n}}$$

iii. Minimum sample size required of the population mean:

$$n = \left(\frac{z\sigma}{E} \right)^2$$

APPENDIX 1 (2)

Estimation of proportion

1. Margin of error for the point estimation of p : $\pm 1.96\sqrt{\frac{\hat{p}\,\hat{q}}{n}}$

2. Confidence interval p for a large sample

$$\hat{p} \pm Z\sqrt{\frac{\hat{p}\hat{q}}{n}}$$

3. Minimum sample size required of the population proportion:

$$n = \frac{Z^2 pq}{E^2}$$

Hypothesis testing

1. Test statistics for mean $= \frac{\bar{x} - \mu}{\sigma / \sqrt{n}}$

2. Test statistics for proportion $= \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}}$

APPENDIX 2

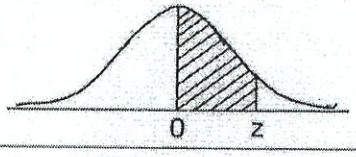
Table

NORMAL DISTRIBUTION

Statistical Table

The following table gives the areas under the standard normal curve from 0 to z

Eg: $P(0 \leq z \leq 1.24) = 0.3925$



z	0	1	2	3	4	5	6	7	8	9
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0754
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2258	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2518	.2549
0.7	.2580	.2612	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2996	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990
3.1	.4990	.4991	.4991	.4991	.4992	.4992	.4992	.4992	.4993	.4993
3.2	.4993	.4993	.4994	.4994	.4994	.4994	.4994	.4995	.4995	.4995
3.3	.4995	.4995	.4995	.4996	.4996	.4996	.4996	.4996	.4996	.4997
3.4	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4998
3.5	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998
3.6	.4998	.4998	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.7	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.8	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.9	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000